Stochastic Flow Diagrams: A Tool To Visualize Systemic Risk

Scientific Data Management Research Group, Lawrence Berkeley National Laboratory

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1   Project description

Following the financial crisis induced by the subprime mortgage problems of 2008, both financial industry and the regulatory agencies recognize the need for new methods, tools and algorithms to monitor, understand, and mitigate the systemic risks in the financial sector of our economy. Similar large interacting systems including electric power grid, energy supplies, and ecosystems could benefit from studies of systemic risks as well. In pursuit of such a tool, researchers at LBNL have been engaged in developing the concept of Stochastic Flow Diagrams (SFD) as a topological representation of complex interacting systems. Preliminary studies have demonstrated the concept to be applicable to the modeling of propagation and reverberation of shocks using a small set of macroeconomics data from recent past. Based on these early results, we are in a strong position to develop the necessary high-performance software tools for applying the concept on much larger data sets and demonstrate the wider applicability of SFD.

2   Task Goals and requirements

During the summer of 2016, we plan to explore the option of high-performance implementation of SFD techniques. The intern is expected to study the key implementation strategies and design choices. The intern will also be responsible for laying out the outline of implementation plan, and implement the key building blocks. This work will also involve interacting with staff and outside consultants to understand the impact of the design choices and demonstrate the pros and cons of the choices made. Task requirements are following:

- Strong analytical skills
- Proficient in programming languages C/C++
- Familiar with parallelization technology such as posix threading, openCL and MPI
- Good problem solving skills and communication skills

Students will learn about advanced statistics and data analysis techniques, debugging C/C++ applications, and help solving computational finance problems.

About the group

The Scientific Data Management (SDM) group develops technologies and tools for efficient data access and storage management of massive scientific data sets. We are currently developing storage resource management tools, data querying technologies, in situ feature extraction algorithms, along with software platforms for exascale data. The group also works closely with application scientists to address their data processing challenges. These tools and application development activities are backed by active research efforts on novel algorithms for emerging hardware platforms.